

Rule 10.1. Wireline Service Operations and Subsurface Tracer Studies; Safety Standards

410 IAC 5-10.1-1 Scope of rule

Sec. 1. 410 IAC 5-10.1 establishes *[sic.]* radiation safety requirements for persons using sources of radiation for wireline service operations including mineral logging, radioactive markers, and subsurface tracer studies. The requirements of this section are in addition to, and not in substitution for, the requirements of 410 IAC 5-1, 410 IAC 5-2, 410 IAC 5-3, 410 IAC 5-4, and 410 IAC 5-10.

410 IAC 5-10.1-2 Applicability of rule

Sec. 2. 410 IAC 5 applies to all licensees or registrants who use sources of radiation for wireline service operations including mineral logging, radioactive markers or subsurface tracer studies.

410 IAC 5-10.1-3 Definitions

Sec. 3. As used in 410 IAC 5-10.1 the following definitions apply:

"Field station" means a facility where radioactive sources may be stored or used and from which equipment is dispatched to temporary jobsites.

"Injection tool" means a device used for controlled subsurface injection of radioactive tracer material.

"Logging supervisor" means the individual who provides personal supervision of the utilization of sources of radiation at the well site.

"Logging tool" means a device used subsurface to perform well-logging.

"Mineral logging" means any logging performed for the purpose of mineral exploration other than oil or gas.

"Personal supervision" means guidance and instruction by the supervisor who is physically present at the jobsite and watching the performance of the operation in such proximity that contact can be maintained and immediate assistance given as required.

"Radioactive marker" means radioactive material placed subsurface or on a structure intended for subsurface use for the purpose of depth determination or direction orientation.

"Source holder" means a housing or assembly into which a radioactive source is placed for the purpose of facilitating the handling and use of the source in well-logging operations.

"Subsurface tracer study" means the release of a substance tagged with radioactive material for the purpose of tracing the movement or position of the tagged substance in the well-bore or adjacent formation.

"Temporary jobsite" means a location to which radioactive materials have been dispatched to perform wireline service operations or subsurface tracer studies.

"Well-bore" means a drilled hole in which wireline service operations and subsurface tracer studies are performed.

"Well-logging" means the lowering and raising of measuring devices or tools which may contain sources of radiation into well-bores or cavities for the purpose of obtaining information about the well and/or adjacent formations.

"Wireline" means a cable containing one or more electrical conductors which is used to lower and raise logging tools in the well-bore.

"Wireline service operation" means any evaluation or mechanical service which is performed in the well-bore using devices on a wireline.

410 IAC 5-10.1-4 Prohibition

Sec. 4. No licensee shall perform wireline service operations with a sealed source(s) unless, prior to commencement of the operation, the licensee has a written agreement with the well operator, well owner, drilling contractor or land owner that:

(a) In the event a sealed source is lodged downhole, a reasonable effort at recovery will be made; and

(b) In the event a decision is made to abandon the sealed source downhole, the requirements of 410 IAC 5-10.1-25(c) shall be met.

410 IAC 5-10.1-5 Transportation and dose limit requirements

Sec. 5. Sources of radiation shall be used, stored, and transported in such a manner that the transportation requirements of 410 IAC 5-3 and the dose limitation requirements of 410 IAC 5-4 are met.

410 IAC 5-10.1-6 Storage precautions

Sec. 6. (a) Each source of radiation, except accelerators, shall be provided with a storage and/or transport container. The container shall be provided with a lock, or tamper seal for calibration sources, to prevent unauthorized removal of, or exposure

to, the source of radiation.

(b) Sources of radiation shall be stored in a manner which will minimize danger from explosion and/or fire.

410 IAC 5-10.1-7 Transport precautions

Sec. 7. Transport Precautions. Transport containers shall be physically secured to the transporting vehicle to prevent accidental [*sic.*] loss, tampering or unauthorized removal.

410 IAC 5-10.1-8 Survey instruments

Sec. 8. (a) The licensee or registrant shall maintain sufficient calibrated and operable radiation survey instruments at each field station to make physical radiation surveys as required by this part and by 410 IAC 5-4-9. Instrumentation shall be capable of measuring 0.1 milliroentgen per hour through at least 20 milliroentgens per hour.

(b) Each radiation survey instrument shall be calibrated:

- (1) At intervals not to exceed 6 months and after each instrument servicing;
- (2) At energies and radiation levels appropriate for use; and
- (3) So that accuracy within plus or minus 20 percent of the true radiation level can be demonstrated on each scale.

(c) Calibration records shall be maintained for a period of 2 years for inspection by the board.

410 IAC 5-10.1-9 Leak testing of sealed sources

Sec. 9. (a) Requirements. Each licensee using sealed sources of radioactive material shall have the sources tested for leakage. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the board for 6 months after the next required leak test is performed or until transfer or disposal of the sealed source.

(b) Method of Testing. Tests for leakage shall be performed only by persons specifically authorized to perform such tests by the board, the U.S. Nuclear Regulatory Commission, an agreement state or a licensing state. The test sample shall be taken from the surface of the source, source holder or from the surface of the device in which the source is stored or mounted and on which one might expect contamination to accumulate. The test sample shall be analyzed for radioactive contamination, and the analysis shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample.

(c) Interval of Testing. Each sealed source of radioactive material shall be tested at intervals not to exceed 6 months. In the absence of a certificate from a transferor indicating that a test has been made prior to the transfer, the sealed source shall not be put into use until tested. If for any reason, it is suspected that a sealed source may be leaking, it shall be removed from service immediately and tested for leakage as soon as practical.

(d) Leaking or Contaminated Sources. If the test reveals the presence of 0.005 microcurie or more of leakage or contamination, the licensee shall immediately withdraw the source from use and shall cause it to be decontaminated, repaired or disposed of in accordance with 410 IAC 5. A report describing the equipment involved, the test results, and the corrective action taken shall be filed with the board.

(e) Exemptions. The following sources are exempted from the periodic leak test requirements of 410 IAC 5-10.1-9(a) through (d):

- (1) Hydrogen-3 sources;
- (2) Sources of radioactive material with a half-life of 30 days or less;
- (3) Sealed sources of radioactive material in gaseous form;
- (4) Sources of beta- and/or gamma-emitting radioactive material with an activity of 100 microcuries or less; and
- (5) Sources of alpha-emitting radioactive material with an activity of 10 microcuries or less.

410 IAC 5-10.1-10 Quarterly inventory

Sec. 10. Each licensee or registrant shall conduct a quarterly physical inventory to account for all sources of radiation. Records of inventories shall be maintained for 2 years from the date of the inventory for inspection by the board and shall include the quantities and kinds of sources of radiation, the location where sources of radiation are assigned, the date of the inventory, and the name of the individual conducting the inventory.

410 IAC 5-10.1-11 Utilization records

Sec. 11. Each licensee or registrant shall maintain current records, which shall be kept available for inspection by the board for 2 years from the date of the recorded event, showing the following information for each source of radiation:

- (a) Make, model number, and a serial number or a description of each source of radiation used;
- (b) The identity of the well-logging supervisor or field unit to whom assigned;
- (c) Locations where used and dates of use; and

(d) In the case of tracer materials and radioactive markers, the utilization record shall indicate the radionuclide and activity used in a particular well.

410 IAC 5-10.1-12 Sealed sources used in downhole operations

Sec. 12. Design, Performance, and Certification Criteria for Sealed Sources Used in Downhole Operations.

(a) Each sealed source, except those containing radioactive material in gaseous form, used in downhole operations and manufactured one year after the effective date of 410 IAC 5 shall be certified by the manufacturer or other testing organization acceptable to the board to meet the following minimum criteria:

- (1) Be of doubly encapsulated construction;
- (2) Contain radioactive material whose chemical and physical forms are as insoluble and nondispersible as practical; and
- (3) Has been individually pressure tested to at least 24,656 pounds per square inch absolute (170 MN/m^2) without failure.

(b) For sealed sources, except those containing radioactive material in gaseous form, acquired one year after the effective date of 410 IAC 5, in the absence of a certificate from a transferor certifying that an individual sealed source meets the requirements of 410 IAC 5-10.1-12(a), the sealed source shall not be put into use until such determinations and testing have been performed.

(c) Each sealed source, except those containing radioactive material in gaseous form, used in downhole operations two years after the effective date of 410 IAC 5 shall be certified by the manufacturer, or other testing organization acceptable to the board, as meeting the sealed source performance requirements for oil well-logging as contained in the American National Standard N542, "Sealed Radioactive Sources, Classification" in effect on the effective date of 410 IAC 5.

(d) Certification documents shall be maintained for inspection by the board for a period of 2 years after source disposal. If the source is abandoned downhole, the certification documents shall be maintained until the board authorizes disposition.

410 IAC 5-10.1-13 Labels

Sec. 13. (a) Each source, source holder or logging tool containing radioactive material shall bear a durable, legible, and clearly visible marking or label, which has, as a minimum, the standard radiation caution symbol, without the conventional color requirement, and the following wording:

DANGER¹/
RADIOACTIVE

This labeling shall be on the smallest component transported as a separate piece of equipment.

(b) Each transport container shall have permanently attached to it a durable, legible, and clearly visible label which has, as a minimum, the standard radiation caution symbol and the following wording:

DANGER¹/
RADIOACTIVE
NOTIFY CIVIL AUTHORITIES
(OR NAME OF COMPANY)

¹/ or CAUTION

410 IAC 5-10.1-14 Inspection and maintenance

Sec. 14. (a) Each licensee or registrant shall conduct, at intervals not to exceed 6 months, a program of inspection and maintenance of source holders, logging tools, source handling tools, storage containers, transport containers, and injection tools to assure proper labeling and physical condition. Records of inspection and maintenance shall be maintained for a period of 2 years for inspection by the board.

(b) If any inspection conducted pursuant to 410 IAC 5-10.1-14(a) reveals damage to labeling or components critical to radiation safety, the device shall be removed from service until repairs have been made.

(c) The repair, opening, or modification of any sealed source shall be performed only by persons specifically authorized to do so by the board, the U.S. Nuclear Regulatory Commission, an agreement state or a licensing state.

410 IAC 5-10.1-15 Training and testing of personnel

Sec. 15. (a) No licensee or registrant shall permit any individual to act as a logging supervisor as defined in this part until such individual has:

- (1) Received, in a course recognized by the board, the U.S. Nuclear Regulatory Commission, an agreement state or a licensing state instruction in the subjects outlined in 410 IAC 5-10.1-26 and demonstrated an understanding thereof;
- (2) Read and received instruction in the requirements contained in 410 IAC 5-10.1 and the applicable sections of 410 IAC 5-1, 410 IAC 5-4, and 410 IAC 5-10 or their equivalent, conditions of appropriate license or certificate of registration, and

the licensee's or registrant's operating and emergency procedures, and demonstrated an understanding thereof; and

(3) Demonstrated competence to use sources of radiation, related handling tools, and radiation survey instruments which will be used on the job.

(b) No licensee or registrant shall permit any individual to assist in the handling of sources of radiation until such individual has:

(1) Read or received instruction in the licensee's or registrant's operating and emergency procedures and demonstrated an understanding thereof; and

(2) Demonstrated competence to use, under the personal supervision of the logging supervisor, the sources of radiation, related handling tools, and radiation survey instruments which will be used on the job.

(c) The licensee or registrant shall maintain employee training records for inspection by the board for 2 years following termination of employment.

410 IAC 5-10.1-16 Operating and emergency procedures

Sec. 16. The licensee's or registrant's operating and emergency procedures shall include instructions in at least the following:

(a) Handling and use of sources of radiation to be employed so that no individual is likely to be exposed to radiation doses in excess of the standards established in 410 IAC 5-4;

(b) Methods and occasions for conducting radiation surveys;

(c) Methods and occasions for locking and securing sources of radiation;

(d) Personnel monitoring and the use of personnel monitoring equipment;

(e) Transportation to temporary jobsites and field stations, including the packaging and placing of sources of radiation in vehicles, placarding of vehicles, and securing sources of radiation during transportation;

(f) Minimizing exposure of individuals in the event of an accident;

(g) Procedure for notifying proper personnel in the event of an accident;

(h) Maintenance of records;

(i) Inspection and maintenance of source holders, logging tools, source handling tools, storage containers, transport containers, and injection tools;

(j) Procedure to be followed in the event a sealed source is lodged downhole; and

(k) Procedures to be used for picking up, receiving, and opening packages containing radioactive material.

410 IAC 5-10.1-17 Personnel monitoring

Sec. 17. (a) No licensee or registrant shall permit any individual to act as a logging supervisor or to assist in the handling of sources of radiation unless each such individual wears either a film badge or a thermoluminescent dosimeter (TLD). Each film badge or TLD shall be assigned to and worn by only one individual.

(b) Personnel monitoring records shall be maintained for inspection until the board authorizes disposition.

410 IAC 5-10.1-18 Security during operations

Sec. 18. During each logging or tracer application, the logging supervisor or other designated employee shall maintain direct surveillance of the operation to protect against unauthorized and/or unnecessary entry into a restricted area, as defined in 410 IAC 5-1.

410 IAC 5-10.1-19 Handling tools

Sec. 19. The licensee shall provide and require the use of tools that will assure remote handling of sealed sources other than low-activity calibration sources.

410 IAC 5-10.1-20 Subsurface tracer studies

Sec. 20. (a) Protective gloves and other appropriate protective clothing and equipment shall be used by all personnel handling radioactive tracer material. Precautions shall be taken to avoid ingestion or inhalation of radioactive material.

(b) No licensee shall cause the injection of radioactive material into potable aquifers without prior written authorization from the board.

410 IAC 5-10.1-21 Particle accelerators

Sec. 21. No licensee or registrant shall permit above-ground testing of particle accelerators, designed for use in well-logging, which results in the production of radiation, except in areas or facilities controlled or shielded so that the

requirements of 410 IAC 5-4-2 and 410 IAC 5-4-6 as applicable, are met.

410 IAC 5-10.1-22 Surveys; records

Sec. 22. (a) Radiation surveys and/or calculations shall be made and recorded for each area where radioactive materials are stored.

(b) Radiation surveys and/or calculations shall be made and recorded for the radiation levels in occupied positions and on the exterior of each vehicle used to transport radioactive material. Such surveys and/or calculations shall include each source of radiation or combination of sources to be transported in the vehicle.

(c) After removal of the sealed source from the logging tool and before departing the jobsite, the logging tool detector shall be energized, or a survey meter used, to assure that the logging tool is free of contamination.

(d) Radiation surveys shall be made and recorded at the jobsite or well-head for each tracer operation, except those using hydrogen-3, carbon-14, and sulfur-35. These surveys shall include measurements of radiation levels before and after the operation.

(e) Records required pursuant to 410 IAC 5-10.1-22(a) through (d) shall include the dates, the identification of individual(s) making the survey, the identification of survey instrument(s) used, and an exact description of the location of the survey. Records of these surveys shall be maintained for inspection by the board for 2 years after completion of the survey.

410 IAC 5-10.1-23 Recordkeeping at field stations

Sec. 23. Each licensee or registrant shall maintain, for inspection by the board, the following documents and records for the specific devices and sources used at the field station:

- (a) Appropriate license, certificate of registration or equivalent document;
- (b) Operating and emergency procedures;
- (c) Applicable regulations;
- (d) Records of the latest survey instrument calibrations pursuant to 410 IAC 5-10.1-22;
- (e) Records of the latest leak test results pursuant to 410 IAC 5-10.1-9;
- (f) Quarterly inventories required pursuant to 410 IAC 5-10.1-10;
- (g) Utilization records required pursuant to 410 IAC 5-10.1-11;
- (h) Records of inspection and maintenance required pursuant to 410 IAC 5-10.1-14; and
- (i) Survey records required pursuant to 410 IAC 5-10.1-22.

410 IAC 5-10.1-24 Recordkeeping at temporary jobsites

Sec. 24. Each licensee or registrant conducting operations at a temporary jobsite shall have the following documents and records available at that site for inspection by the board:

- (a) Operating and emergency procedures;
- (b) Survey records required pursuant to 410 IAC 5-10.1-22 for the period of operation at the site;
- (c) Evidence of current calibration for the radiation survey instruments in use at the site; and
- (d) When operating in the state under reciprocity, a copy of the appropriate license, certificate of registration or equivalent document(s).

410 IAC 5-10.1-25 Notification of incidents, abandonment, and lost sources

Sec. 25. (a) Notification of incidents and sources lost in other than downhole logging operations shall be made in accordance with appropriate provisions of 410 IAC 5-4.

(b) Whenever a sealed source or device containing radioactive material is lodged downhole, the licensee shall:

- (1) Monitor at the surface for the presence of radioactive contamination with a radiation survey instrument or logging tool during logging tool recovery operations; and
- (2) Notify the board immediately by telephone if radioactive contamination is detected at the surface or if the source appears to be damaged.

(c) When it becomes apparent that efforts to recover the radioactive source will not be successful, the licensee shall:

- (1) Advise the well-operator of 410 IAC 5 and an appropriate method of abandonment, which shall include:
 - (i) The immobilization and sealing in place of the radioactive source with a cement plug;
 - (ii) The setting of a whipstock or other deflection device; and
 - (iii) The mounting of a permanent identification plaque, at the surface of the well, containing the appropriate information required by 410 IAC 5-10.1-25(d).
- (2) Notify the board by telephone, giving the circumstances of the loss, and request approval of the proposed abandonment

procedures; and

(3) File a written report with the board within 30 days of the abandonment, setting forth the following information:

- (i) Date of occurrence and a brief description of attempts to recover the source;
- (ii) A description of the radioactive source involved, including radionuclide, quantity, and chemical and physical form;
- (iii) Surface location and identification of well;
- (iv) Results of efforts to immobilize and set the source in place;
- (v) Depth of the radioactive source;
- (vi) Depth of the top of the cement plug;
- (vii) Depth of the well; and
- (viii) Information contained on the permanent identification plaque.

(d) Whenever a sealed source containing radioactive material is abandoned downhole, the licensee shall provide a permanent plaque^{2/} for posting the well or well-bore. This plaque shall:

- (1) Be constructed of long-lasting material, such as stainless steel or monel; and
- (2) Contain the following information engraved on its face:
 - (i) The word "CAUTION";
 - (ii) The radiation symbol without the conventional color requirement;
 - (iii) The date of abandonment;
 - (iv) The name of the well-operator or well owner;
 - (v) The well name and well identification number(s) or other designation;
 - (vi) The sealed source(s) by radionuclide and quantity of activity;
 - (vii) The source depth and the depth to the top of the plug; and
 - (viii) An appropriate warning, depending on the specific circumstances of each abandonment.^{3/}

^{2/} An example of a suggested plaque is shown in 410 IAC 5-10.1-27.

^{3/} Appropriate warnings may include: (a) "Do not drill below plug back depth"; (b) "Do not enlarge casing"; or (c) "Do not re-enter the hole", followed by the words, "before contacting the Indiana state board of health."

(e) The licensee shall immediately notify the board by telephone and subsequently by confirming letter if the licensee knows or has reason to believe that radioactive material has been lost in or to an underground potable water source. Such notice shall designate the well location and shall describe the magnitude and extent of loss of radioactive material, assess the consequences of such loss, and explain efforts planned or being taken to mitigate these consequences

410 IAC 5-10.1-26 Training courses for logging supervisors; scope

Sec. 26.

SUBJECTS TO BE INCLUDED IN TRAINING COURSES FOR LOGGING SUPERVISORS

I. Fundamentals of Radiation Safety

- A. Characteristics of radiation
- B. Units of radiation dose and quantity of radioactivity
- C. Significance of radiation dose
 - 1. Radiation protection standards
 - 2. Biological effects of radiation dose
- D. Levels of radiation from sources of radiation
- E. Methods of minimizing radiation dose
 - 1. Working time
 - 2. Working distances
 - 3. Shielding

II. Radiation Detection Instrumentation to be Used

- A. Use of radiation survey instruments
 - 1. Operation
 - 2. Calibration
 - 3. Limitations
- B. Survey techniques
- C. Use of personnel monitoring equipment

III. Equipment to be Used

- A. Handling equipment
- B. Sources of radiation
- C. Storage and control of equipment
- D. Operation and control of equipment
- IV. The Requirements of Pertinent Federal and State Rules
- V. The Licensee's or Registrant's Written Operating and Emergency Procedures
- VI. The Licensee's or Registrant's Record Keeping Procedures

410 IAC 5-10.1-27 Plaque on wells containing abandoned sealed sources

Sec. 27. Example of Plaque for Identifying Wells Containing Sealed Sources Containing Radioactive Material Abandoned Downhole

[COMPANY NAME]
[WELL IDENTIFICATION]



CAUTION
ONE 2 CURIE CS-137 RADIOACTIVE SOURCE ABANDONED
3-3-75 AT 8400 FT. PLUG BACK DEPTH 8200 FT.
DO NOT RE-ENTER THIS WELL BEFORE CONTACTING
INDIANA STATE BOARD OF HEALTH



The size of the plaque should be convenient for use on active or inactive wells; e.g., a 7-inch square. Letter size of the word "CAUTION" should be approximately twice the letter size of the rest of the information; e.g., 1/2-inch and 1/4-inch letter size, respectively.